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the school was transferred to that building, where it has since been carried on under the name of the King Edward VII. Nautical School, and has had many among its students who have risen high in the profession. Captain Nicholls was the author of several works on navigation and astronomy, including *Seamanship and Guide*, and *Concise Rules to Board of Trade Examinations.* He was a member of the British Astronomical Association, and had taken up work in connection with the Variable Star Section.

He died suddenly, from the result of an operation, on 4th March 1906, leaving a widow and six young children.

He was elected a Fellow of the Royal Astronomical Society in March 1905.

Robert Rawson was born at Brinsley, a small colliery village nine miles from Nottingham, on the 22nd July 1814. His father, John Rawson, was a man of very limited means, whose life seems to have been a long struggle against adverse circumstances.

Robert Rawson was a child of seven when he began work in the coal-mines of Messrs Barter & Walker at Eastwood, two or three miles from his home at Brinsley, and he never forgot the long walks in all weathers to and from the mines. It was during this sixteen years, when working as a collier, that he laid the foundation of his future success. One day he came across a periodical containing a variety of mathematical questions, to some of which he could see the answer; but not being able to master all, he made inquiries and was told that he wanted an "arithmetic." Accordingly, one Saturday afternoon, on leaving the pit, he walked into Nottingham and bought a second-hand arithmetic for twopence. This he used to find the answers to the particular questions; he never worked through it. In the same way he acquired an algebra, then an old *Euclid*, and more advanced works. In 1837, when Robert Stevenson commenced building the Manchester and Leeds Railway, Rawson obtained employment as clerk and draughtsman in a constructor's office at Rochdale. He did not seek this situation; it was offered under the following circumstances. A controversy arose in a local paper as to how the level of the road should be altered at a curve in the railway, so as to counteract the effect of centrifugal force. Rawson gave his solution, and a few days later the railway engineer sent for him. As he presented himself in collier's dress and spoke the colliers' dialect, there was at first some misunderstanding. In the end it was arranged that he should leave the mines and go to the office. When the railway was completed in 1842 he removed to Manchester and became a teacher of mathematics, and kept up a correspondence with the *York Courant*, the *Mathematician*, the *Lady's and Gentleman's Diary*. He also wrote papers on the "Summation of Series," "Definite Integration," etc. etc., which were published in the *Memoirs* of the Manchester Literary and Philosophical Society.

In 1845 he joined the Manchester Society, and two years later had a seat on its council, where he came into contact with leading

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practical engineers and chemists. At this time he was employed by Stevenson to calculate the stress on the girders of the Menai Bridge, and by Eaton Hodgkinson to determine the strength of cast-iron pillars and other materials.

In 1843 the Admiralty established a school in each of the dockyards for the education of engineers and shipwright apprentices. The instruction was at first given by the dockyard officers, but in 1847 it was considered that properly qualified masters should be appointed. Hodgkinson, to whom the First Lord applied, recommended Rawson, who was rather dubious, as he had never had experience of school life, in fact had never set his foot inside a school. However, for a period of twenty-eight years he held the post at Portsmouth with credit to himself and advantage to his pupils. Many of those passing through his school are now filling places of high distinction in the service of the Admiralty and of the great shipbuilding yards. It will suffice to mention Sir Philip Watts, K.C.B., the present Director of Naval Construction; Sir John Durston, K.C.B., Engineer-in-chief R.N.; Sir James Williamson; and Professor Francis Elgar, F.R.S.

While at the dockyard school he was appointed by the Lords Commissioners of the Admiralty to make experiments, in conjunction with the master shipwright, John Fincham, to test the validity of Moseley's formulæ for the dynamical stability of ships. Moseley gives an account of these experiments in a paper entitled "On the Dynamical Stability of Ships and on the Oscillations of Floating Bodies," in the *Philosophical Transactions*, 1851, and speaks in high terms of Rawson's ability.

Rawson devised the screw compass, which determines at sight the pitch of the screw: for this invention he received the thanks of the Admiralty. In 1851 he published a treatise on *The Screw-Propeller: an Investigation of its Geometrical Properties*, and some elementary works on arithmethic, mensuration, and trigonometry.

The great bulk of Rawson's papers are in the *Memoirs* of the Manchester Literary and Philosophical Society, but some will be found in the British Association *Reports*, the Naval Architects' *Transactions*, and the *Messenger of Mathematics*. These papers deal with differential equations; prime numbers; friction of water; oscillation of floating bodies; stability of ships; screw propulsion, etc. etc., his last paper being on "Dr Ferrers' Theorem on Prime Numbers" in the *Messenger of Mathematics*, 1895.

In April 1894 he was placed on the commission of the peace for the county of Hampshire, and, notwithstanding his great age, he discharged his duties as a magistrate with great zeal and ability up to within a month of his death. He was twice married; first, in 1851, to Mrs Baldock, daughter of his friend John Fincham, and again, in 1870, to Miss Aylword, daughter of a former master shipwright in Plymouth Dockyard. There was no issue of either marriage. Mr Rawson was a man of active habits and temperate living, rising at 5 in the morning and retiring at 8.30

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in the evening. His days were spent working in his garden, walking and cycling. In the spring of 1906, while out walking at 6 o'clock on a frosty morning, he slipped and bruised himself. An attack of influenza supervened, which developed into pneumonia, and on 11th March he died at the advanced age of ninety-two. Mr Rawson was one of those men who inspire affection and command the homage of heart as well as intellect. At his funeral, which took place 16th March 1906 at the Havant cemetery, were, besides the representatives of the leading county families and a number of his fellow-magistrates, many of his old pupils, some of whom had travelled great distances to pay their last tribute of respect.

Mr Rawson was an Associate of the Institute of Naval Architects, and a member of the London Mathematical Society. He was elected a Fellow of the Royal Astronomical Society on the 9th November 1889.

WILLIAM JOHN REYNOLDS was the eldest son of William Reynolds, a carmine manufacturer of Hackney. He was born at Clapton 2nd September 1845, and attended the local schools, and afterwards a boarding-school at Greenwich, and finally Homerton College, at that time under Dr Unwin. Being of a mechanical turn of mind, he was bound apprentice to a firm of pianoforte makers in Clerkenwell. This firm coming to an abrupt end, Reynolds became clerk in the office of the Metropolitan Drinking Fountain Association in Clement's Lane. At his father's death, he, in conjunction with his brother, carried on the manufacture of carmine at Hackney for many years. Finally he joined with Mr Fred Baddeley, forming the firm of Baddeley & Reynolds, engravers and die-sinkers, in the Old Bailey.

Mr Reynolds married in 1880 and had one daughter. He seems to have interested himself in many subjects, and especially in Horology and Astronomy, and often answered the questions of inquirers in the *English Mechanic.* He also interested himself in social matters, being at one time Secretary to the South Place Ethical Society, and was a man much esteemed amongst his acquaintances. His death occurred on 15th July 1906, at "Varna," Palmer's Green.

He was elected a Fellow of the Society on 11th June 1898.

PHILIP EDWARD SEWELL was born in London on the 14th January 1822. His father, Isaac Sewell, was a member of the Society of Friends, and his mother (*née* Mary Wright) was a lady of some literary repute. His education commenced at Hackney Grammar School, then in charge of Canon Eden, and finished at the Friends' School at Stoke Newington. On leaving school he joined the London and County Bank at Brighton, of which his father was manager. Shortly afterwards he was entered for Cambridge University, but a breakdown in his health necessitating an outdoor life, he took up civil-engineering, under Mr C. E. Vignoles. In 1849 he married Sarah, youngest daughter of